

1. SUMMARY OF IMPORTANT EVENTS

The war during the past year has added considerably to the work of the Department which has fortunately been in a position to assist the Military Authorities in both Medical and Health matters. The increased reserve of stores now held by the Department has also enabled assistance to be given in this direction as well.

2. The middle of the year saw a sudden and considerable increase in the garrison and the Department assisted in the advance preparation of camp and barrack sanitary arrangements. A British Sanitary Superintendent was withdrawn from the Protectorate for this purpose and worked in conjunction with the Army Hygiene Section. This Department also assisted in the supervision of anti-malarial work to the East of Freetown, which is being executed by the Army Authorities in order to protect units in that area. The occupation of Wilberforce Barracks and Lunley by European Troops has necessitated an extensive malaria control to the West of Freetown including Murray Town and Aberdeen. This is being carried out by the Department with assistance from the Field Hygiene Section, the cost being borne by the Imperial Government.

3. Hospital accommodation for Army Nursing Sisters has been provided pending the completion of military accommodation for that purpose. All X-Ray work for the Army has so far been carried out by the civil authorities.

4. On the other hand the Military Authorities have been able to assist this Department in several ways, including the loan of a pathologist during a temporary acute shortage of staff due to illness. The Department is generally in close touch with the military medical authorities, and co-operation on both sides has been most willing and cordial.

5. During the year three European Medical Officers were released for military service with West African Troops operating in East Africa, one European Medical Officer retired on pension and one resigned from the service.

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A retired Senior Medical Officer was re-employed to fill one vacancy, and a local Medical Practitioner has been engaged on contract to fill temporarily another of the vacancies. The Department is, however, three short of establishment which is a considerable proportion in a small Department.

6. Financial circumstances arising out of the war have precluded the Liverpool School of Tropical Medicine from continuing its support of the Sir Alfred Jones Research Laboratory. As the Laboratory services of the Colony were so largely dependent on this institution the Government decided to discontinue, for the period of the war, its own Laboratory in the Connaught Hospital and to meet the total cost of maintaining the Sir Alfred Jones Laboratory on the understanding that the institution would undertake all the routine bacteriological and pathological services of the Colony. This arrangement of course necessitated the cessation of practically all research work. As in past years Government is greatly indebted to the Director and his staff for their invaluable collaboration with the Medical and Health Services of the Colony.

GENERAL DISEASES

(i) Nutritional Diseases

An acute shortage of rice occurred towards the end of the wet season and several cases of Beri-Beri were admitted in the Connaught Hospital from among the general public. Shortly after the new crop came on the market the disease disappeared and no further cases have been noted. During the shortage imported rice was used to a considerable extent.

During the year an increase of nutritional defects was noticed more particularly in Freetown in those attending hospitals and clinics. This is undoubtedly due to difficulties in obtaining adequate supplies of protective foodstuffs, a position which has arisen as a result of war conditions. There has also been a considerable rise in the cost of living which has affected the poorer classes.

In February there was a small outbreak of Beri-Beri in

the Mental Hospital at Kissy. Eight cases with one death occurred. The disease was of the paraplegic type. The cause of this was rice which had ^{been} overmilled. This rice was part of a large stock purchased by Government shortly after the outbreak of war. This rice was old when purchased and had been milled twice to keep it in reasonable condition. It was obvious that the diet scale was inadequate in these circumstances but had been satisfactory so long as the rice was not overmilled. The scale has now been revised and amplified and no further cases have occurred.

Further investigations into the problem of malnutrition in the Protectorate are being undertaken in the area affected by sleeping sickness.

(ii) OTHER DISEASES

Attendances at Hospitals and Dispensaries for the year were as follows:-

FREEPORT & COLONY

| | | 1939 | 1940 |
|------------------------------|-------|-------------|-----------------------------|
| <u>Inpatients</u> | | 4137 | 4731 |
| <u>Outpatients</u> | | | <u>215</u> <u>68-4</u> |
| New cases | | 52,281 | 60,749 |
| <u>PROTECTORATE</u> | | <u>1939</u> | <u>1940</u> |
| <u>Inpatients</u> | | 1473 | 2112 |
| <u>Outpatients</u> | | | |
| New cases | | 66,807 | 85,851 |
| <u>COMMUNICABLE DISEASES</u> | | | <u>60749</u> <u>6600</u> |

(1) Malaria - The number of cases attending hospitals and dispensaries during the year does not give any indication of the disability and mortality caused by malaria. There was however evidence to indicate a considerable increase this year during the latter part of June and in July resulting from the unusually irregular nature of the rainfall in the beginning of the wet season which was considerably delayed.

Small sections of swamp have been drained in one or two areas in the Protectorate and proposals are before Government to extend this work next year and a small financial provision has been included in the estimates.

The incidence of malaria among merchant seamen touching at this port has been the cause of considerable concern to the authorities both here and at home and a special malaria investigation unit was sent out from home in September and is at present studying the problem.

Anti-malaria measures for the protection of troops were as follows: The area covered by this scheme is from King Tom peninsula westwards to Aberdeen, along the coast to Lumley, beyond the Babadori River to Levuma Swamp, inland to Wilberforce (excluding Hill Station), along the 400 foot contour line across the Congo River to the Alligator Brook thence to King Tom.

It is divided into five sections and each section has an independent staff consisting of one European supervisor, one Sanitary Learner, house sprayers, oiling men and a drainage gang. The Europeans are supplied from the 49th Field Hygiene Section, R.A.M.C., together with one Biologist, one surveyor, one searcher for larvae and one man who is in charge of "control house" spraying. The whole area is supervised by a British Sanitary Superintendent under the direction of the Assistant Director of Medical Services (Medical Department) and Officer Commanding 49th Field Hygiene Section.

Anti-malarial measures consist of oiling, house spraying with a Pyrethrum insecticide, filling or drainage of pools, clearing and canalising of streams, swamp drainage and treatment of any trees found to be breeding mosquitoes. Permanent drains in swamps are to be made with cement precast slabs, commencing in January.

Work commenced on November 5th and, after a brief rapid survey, house spraying was started, with suitable houses selected for control purposes. Men were instructed in the use of four oaks sprayers and all water, whether an actual, or only probable, breeding place, was oiled weekly. The drainage gang cleared streams of all debris, deepened existing streams in swamps, and then commenced work on permanent drains. Experiments are proceeding to try to ascertain the actual effect of house spraying.

flights of mosquitoes, etc. and results will be given in the final report.

The rise in the number of mosquitoes caught in the Control Houses in Aberdeen and Murray Town from early December onwards showed that a new breeding area had occurred and this proved to be the edges of the swamp at Aberdeen Creek, which, on previous occasions had failed to show any larvae. Careful examination of the area in November resulted in a few larvae being discovered at the extreme land edge of the swamp only. In 1898, Sir Ronald Ross also examined the same area during August and September and remarked on the absence of larvae in what seemed to be a suitable place. (Report of the First Malaria Expedition to Sierra Leone, 1898).

The apparent reason seems to be that during the rains there is sufficient water flowing over the swamp to keep the breeding of *A. gambiae* to a minimum. Numbers increased as the rate of flow decreased. Salinity tests showed that the surface water was almost fresh but gradually became more saline towards the tidal edge. *A. gambiae* var *melas* were found breeding in open crab holes and the surrounds of small mangrove trees in water that contained up to 97% salinity of the sea water from the creek. In addition, it seems as though the flood waters during the rains exert a banking-up effect along the swamp edge as the storm water cannot escape easily because the Sierra Leone River is in spate at the same time. This also tends to reduce the area available for breeding. Tidal measurements are being made to ascertain the actual position during the dry and wet seasons, 1941.

As soon as the increase occurred, the Military Authorities were notified and a Command Order published warning all ranks to take extra precautions during the month following. All European soldiers were relieved from night duty at the Lunley Beach Outposts and no one was permitted to be out of Lovuma Camp after 6. p.m. Night operations were discontinued.

Extra men were engaged so that all houses could be sprayed four times a week instead of the previous twice and oiling ranges were doubled.

The hospital admission rate for one Battalion fell from 15 per day on November 21st to 9 on December 6th, thence to a weekly average of 2 from December 10th to December 21st. This was followed by a slight rise of 2 admissions on December 22nd and an average of one per day until December 27th after which only one admission was reported until January 4th.

It seems as though the catching in Control houses was justified by the fact that early warning was obtained and enabled precautions to be undertaken before the adult mosquitoes became infective apart from any other information gained as to the general effect of anti-malarial measures as a whole.

| Area | Houses sprayed | Bedrooms sprayed | Insecticide used (gallons) |
|---------------|----------------|------------------|----------------------------|
| Wilberforce | 4593 | 13393 | 77 |
| Aberdeen | 2215 | 7114 | 60 |
| Lumley | 2982 | 8519 | 85 |
| Murray Town | 2723 | 6622 | 33 |
| King Tom | <u>8635</u> | <u>30623</u> | <u>110</u> |
| Total: | 21148 | 66271 | 365 |
| Daily Average | 430.65 | 1506.16 | 8.30 |
| " " area | 96.13 | 301.23 | 1.66 |
| " " man | 26.39 | 52.59 | - |

| Area | OILING Pools oiled | Streams oiled (in yards) | Oil used gallons |
|-------------|-----------------------|-----------------------------|---------------------|
| Wilberforce | 335 | 321 | 33 |
| Aberdeen | 3219 | - | 60 |
| Lumley | 5190 | 170 | 115 |
| Murray Town | 885 | 2406 | 70 |
| King Tom | <u>1709</u> | <u>19450</u> | <u>290</u> |
| Total: | 11338 | 22347 | 563 |

CLEARING AND DRAINING

| Area | Streams cleared in yards | Pools filled or drained | New Drains cut in yards |
|-------------|-----------------------------|----------------------------|----------------------------|
| Wilberforce | 17215 | 111 | - |
| Aberdeen | 150 | 72 | 455 |
| Lumley | 1760 | 42 | 290 |
| Murray Town | 520 | 133 | 86 |
| King Tom | <u>1275</u> | <u>64</u> | <u>250</u> |
| Total: | 20920 | 427 | 1031 |
| | ==== | ==== | ==== |

In the Congo River, 80 yards of eroded rock channels were filled with concrete with a cement-rendered surface.

At Aberdeen, 252 yards of contour drains were packed with bamboos (fascine drainage) and covered with palm leaves and earth.

In all areas 67 trees were treated to prevent further mosquito breeding.

In the Wilberforce Area the village drinking water supply was increased by clearing and enlarging existing pools and the outlet canalised.

The spleen indices of children up to 12 years in the villages were determined by Officers of the R.A.M.C.

| | | |
|-------------|--------|------|
| Wilberforce | % rate | 38.5 |
| Murray Town | " " | 82.6 |
| Aberdeen | " " | 73 |
| Lumley | " " | 70 |

ANOPHELINES CAUGHT IN CONTROL HOUSES

| Area | No. of houses | No. of Bedrooms | Result | Dec. 1940 |
|---------------------------------|---------------|-----------------|------------|-------------|
| Wilberforce | 8 | 23 | 9 | 21 |
| Aberdeen | 7 | 26 | 146 | 1163 |
| Lumley | 6 | 18 | 26 | 130 |
| Murray Town | 6 | 21 | 39 | 385 |
| Brookfields | 5 | 22 | 20 | 29 |
| King Tom | 5 | 10 | 5 | 111 |
| Totals: | 35 | 120 | 245 | 1728 |
| Average per house ... | | | 7 | 49.37 |
| Average per room | | | 2.04 | 14.40 |
| Total female anophelines caught | | | 223 | 1698 |
| Total male anophelines caught | | | 22 | 30 |
| " A. Gambiae caught | | | 152 | 1276 |
| " A. " var melas | | | 62 | 410 |
| " A. hancocki | | | 12 | 10 |
| " A. funestus | | | 13 | 27 |
| " A. marshalli | | | 2 | 5 |
| " A. freetownensis | | | 1 | - |
| " A. phedesiensis | | | 1 | - |
| " A. nili | | | 2 | - |

(ii) Sleeping Sickness - The Sleeping Sickness Campaign which is financed by the Colonial Development Fund has made satisfactory progress under the control of an officer seconded from the Nigerian Sleeping Sickness Service. During the year 19,300 persons were examined and 3,063 found to be suffering from the disease, giving an

incidence of 15.9%. In the north eastern part of the district, first dealt with, the incidence was actually a good deal higher, viz. 23.1% but in the remainder it has dropped to 10%. All these had been treated or were under treatment at the end of the year. At the beginning progress was slow as staff were still being trained, but the latter half of 1940 has seen a considerable acceleration. Under the present system of working it is now proving possible to examine 98 or 99 per cent of the total population resident at the time of examination and to give complete courses of treatment to a similar percentage of the surviving cases diagnosed.

Larger blocks of country are now being dealt with as units for diagnosis and treatment these being from 100 to 150 square miles in area, varying in depth and size according to natural and administrative boundaries. The diagnosis and treatment of such an area takes about two and a half months. The majority of cases discovered during routine diagnosis are symptomless or admit to no more symptoms than could be equally well be accounted for by malaria or other common ailment. A considerable proportion complain of chronic headache and intermittent fever and exhibit some mental retardation and dullness of expression; some 2% or 3% show some oedema of the legs; while a small proportion, perhaps 2% are obvious late cases with nervous manifestations. Nevertheless there is no doubt that the disease is of a severe nature. The untreated case mortality rate is calculated to be about 257 per 1000 per annum.

There are no indications that natural arsenic resistance on the part of the trypanosomes is likely to complicate treatment. Results are, on the whole, satisfactory, and it appears justifiable to conclude that the epidemic in its present stage is responding well to the standard treatment. On the other hand toxic manifestations have appeared with considerable frequency and have in some areas been serious. Toxic effects on this scale have not been reported from other countries and a good deal of thought has been given to their elucidation and subsequent elimination.

Trials with certain diamidine compounds have been carried out during the year and the results of these are at present under review.

Tsetse flies appear rather scarce in the areas most heavily infected where population is dense and game is scarce. An investigation of the man-fly relationship will be undertaken in 1941 but it appears unlikely that any large scale control will prove possible in such densely wooded country.

Sampling Surveys have been carried out during the year in the south east and north west portions of the Protectorate but only sporadic cases have been discovered there. No serious new foci have been discovered.

(iii) Yaws - A grant of £400 a year has been obtained from the Colonial Development Fund for the purchase of drugs for the treatment of yaws. Special yaws clinics are now run at all hospitals and dispensaries. Yaws is very prevalent in most parts of the country and in the areas which have been treated for sleeping sickness, where all obvious cases come to notice during routine diagnosis of the latter disease, the incidence ranges from 8% to 20%. Over 1,500 cases were treated 'pari passu' with cases of sleeping sickness. The total number of cases treated throughout the country in 1940 was 14,294 and it is hoped to extend this considerably in 1941.

(iv) Rabies - 2 human cases of rabies occurred. 15 cases of canine rabies were confirmed, 12 in Freetown and Colony, 3 in the Protectorate.

2,375 dogs were destroyed in Freetown and its precincts and 414 inoculated against rabies.

(v) Plague - The usual systematic trapping and examining of rat was continued throughout the year.

Rats caught 6,256.

Rats examined 3,018

No cases of plague were found.

IV. VITAL STATISTICS

It is a matter of some difficulty to provide any vital statistics even for Freetown, which has the only reasonably comprehensive registration system in the country, due to the fact that recent years have seen a large influx of labourers and their dependants into the town. This immigration is unrecorded and estimates of the numbers vary between 10,000 and 15,000.

The estimated mid-year population for 1940 based on the 1931 census and the natural increase in population, as recorded, works out at 65,447 but including immigration figures is more probably not far short of 80,000. Based on the lower figures the Birth and Death rates for Freetown are 21.5 respectively compared with 22.3 and 21.7 in 1939.

The actual births and deaths registered were as follows

| | <u>1939</u> | <u>1940</u> |
|--------|-------------------------|----------------------|
| Births | .. 1436 | 1410 |
| Deaths | .. 1496 (413 certified) | 1540 (487 certified) |

The Infant Mortality rate was 180 compared with 190 in 1939.

All these figures however must be taken with a considerable amount of reserve. It is also more than probable that the recent influx of population is of a type that will not effect registration and the numbers of births and deaths registered are probably short of the actual total of these occurrences particularly in the case of births.

V. HYGIENE AND SANITATION

Although shortage of staff has precluded much advance in health matters in the Protectorate the services in Freetown with its largely increased population of both Africans and Europeans have been maintained at a satisfactorily high level. The Aedes index in the town and environs remained at a reasonably low level throughout the year. In addition to the special mosquito control work carried out to the east and west of the town the urban area itself has been subjected to an intensified control.

(a) Sewage Disposal. The 149th Field Hygiene Section took over the night-soil disposal of the premises occupied by Naval and Military personnel in Freetown.

(b) Water Supply. There was again considerable shortage of water in Freetown in the latter part of the dry season. Large quantities had to be supplied to shipping which accentuated the acuteness of the shortage as far as the civil population was concerned. The new 13½ million gallon reservoir on the Babadori Saddle will be in use by the spring of next year and should help, but as a remedial measure it falls far short of full requirements. Government have now established a Water Board for Freetown with a view to utilising to the best advantage all sources of supply. The purification plant has functioned satisfactorily throughout the year.

Little progress can be reported regarding water supplies in the Protectorate where much remains to be done. Proposals have been considered in several cases but final decisions have not been arrived at.

(c) Labour conditions. The influx of labourers to Freetown and the Colony has resulted in overcrowding both in Freetown and some of the Colony villages. One labour camp to house labourers working with a firm of contractors is projected but not yet built.

The shortage of supervising staff in the Protectorate has precluded mining areas being inspected as frequently as is desirable but all the principal areas have been inspected at least once during the year by an European Officer. Housing and Health conditions in the areas where the larger companies operate have been found satisfactory although in one case the accommodation is insufficient, with the result that a considerable number of labourers lodge in neighbouring towns and villages, a practice which has led to a degree of overcrowding. Special legislation in the form of Rules has however been enacted to deal with this matter and these are now being enforced. Housing conditions in certain gold mining areas where 'tributary' is common are far from satisfactory and the solution of the problem is complicated by the small capital

of individuals concerned and the fleeting nature of the enterprises.

VI. PORT HEALTH WORK AND ADMINISTRATION.

The work of the port has been exceptionally heavy during the year and has been considerably hindered by the lack of adequate launch facilities.

The Port was free from Quarantineable disease during the year.

The Quarantine Station at the Cape has had to be vacated for military reasons and temporary arrangements are being made up river at Kisay.

VII. MATERNITY AND CHILD WELFARE.

The Maternity Hospital was opened in March and has a total bed strength, including ante-natal beds, of 40. 724 patients were admitted of whom 503 gave birth in the wards. Of these, 325 were normal and 173 were abnormal labours. There were five deaths.

There were 1095 women on the registers of the Ante-Natal Clinic during the year, an increase of 159 over last year. An increased amount of home visiting was done, 5,584 visits to homes having been made by Midwives and Health Visitors. The Post-Natal Clinic had 587 names on the register which is 53 more than in 1959.

The Infant Welfare Clinic continues to grow in popularity, and 736 infants were registered with 15,537 attendances. Here again home visiting is considered a most important part of the service and Health Visitors paid 18,427 visits to homes.

Infant Welfare in the Protectorate is progressing slowly but mothers will not as a rule attend Clinics unless their children are actually ill. Absence of the necessary staff even in the larger centres prevents any propaganda in the way of home visiting. An increased nursing staff for the Protectorate is however gradually being provided and twenty-four nurses are already under training for this purpose. A proportion of these will be midwives, and when they are available endeavours will be made to develop the service on better lines. The proposals for the Central Protectorate Hospital to be built at Bo include a Maternity Section which it is hoped will provide a centre for this important work among mothers and children.

It is however gratifying to record a growing appreciation of Ante-Natal Maternity and Infant Welfare services in Freetown where for several years now there has been a steady increase in the work.

VIII. HOSPITALS AND DISPENSARIES.

The influx of labour from the Protectorate to the Colony has had a marked effect on the attendances in the Connaught Hospital in Freetown which show the following increases:-

| <u>CONNAUGHT HOSPITAL</u> | <u>1939</u> | <u>1940</u> | <u>Increase</u> |
|---------------------------|-------------|-------------|-----------------|
| Inpatients: | 2651 | 3392 | 27.9% |
| Outpatients: | | | |

New cases ... 17,244 22,718 31.7%

A proportion of the increase in Inpatients is due to the fact that the opening of the Maternity Hospital in March released beds in the Connaught Hospital for general cases.

The European Hospital at Hill Station has dealt with a considerable increase of inpatients, 326 cases having been dealt with compared with 221 in 1939 and 122 in 1938. The bulk of this increase is accounted for by merchant seamen admitted from ships lying in Port. 272 Outpatients (new cases) were dealt with compared with 212 in 1939 and 204 in 1938.

The accommodation provided in the Colony for cases of mental disease is very inadequate and the only institution available is very congested.

The work of the X-Ray Department has extended and improved considerably under the X-Ray Attendant appointed early in the year. A transportable set has been obtained this year and has proved of great value. 1689 patients were dealt with involving 3327 examinations, compared with 770 patients and 1253 examinations in 1939. 574 military patients involving 964 examinations are included in the figures for this year.

The increased number of beds now available in the Protectorate have been made good use of, and the extended hospitals at Bo and Pujehun have dealt with a considerable increase of patients. The new hospital at Bonthe was completed during the year and was

officially opened by the Officer Administering the Government before a large gathering of Chiefs and Notables in the surrounding district. The hospital provides accommodation for 36 patients in buildings which are a great advance in design over any hitherto so far built in this Colony. Two new dispensaries were under construction during the year, one at Gbup in the Bonthe District and one at Yonibana in the Bombali District. Next year's programme includes a further two, and the construction of new buildings to house two existing dispensaries.

IX. SUMMARY OF THE WORK DONE BY THE SIR ALFRED LEWIS JONES RESEARCH LABORATORY.

On 1st January 1940, the Sir Alfred Lewis Jones Research Laboratory became fully responsible for the laboratory services of the Colony as a temporary measure. Dr. H. A. Rennier who promoted to be Senior Medical Officer, Sierra Leone. The Connaught Hospital Laboratory was attended daily by the European and African staff of the Sir Alfred Lewis Jones Research Laboratory and the routine work was carried out there, the bacteriological, serological and other more elaborate investigations being performed, as in former years, in the Tower Hill Laboratory.

Dr. A. J. Walker, Assistant Director, having completed a tour of twenty-two months, proceeded on leave on 10th July and returned on 8th December. During the period of his leave, Professor T. H. Davey carried on the laboratory service unaided as it had been found impossible to second a Medical Officer for relief duty. Towards the end of October Professor Davey was placed on the sick list and was not permitted to return to work until after a period of leave. In the emergency thus created, Government requested Major B. Macgrath, R.A.M.C., Army Pathologist, to carry on such pathological work for the Colony as was essential. Major Macgrath agreed to this and generously performed necessary laboratory work until Dr. Walker's return.

Professor Davey attempted to leave the Colony on 1st June after Dr. Walker's return but was unable to obtain a passage to the end of the year.

During this year, at the request of Government,

to this Anopheline species of West Africa was prepared and published. This key had been requested some years ago by the West African Governments and has been the subject of work by the Laboratory staff. In its present form it is incomplete, and it is hoped in the near future to prepare a complete and illustrated key.

The work performed during the year has been classified under two heads, routine and scientific, and is herewith recorded. It will be noted that there has been no significant decrease in the amount of general routine work dealt with in spite of the fact that only one member of staff was available during the last six months of the year. Autopsies, which are often of a very laborious nature, show an increase from 61 in 1939 to 84 in 1940, with a corresponding increase in time spent giving evidence in court.

A. ROUTINE

(1) Bacteriological Examinations.

95 cultures, 51 examinations of water supplies, 1384 Seriological examinations, 8,130 miscellaneous microscopical examinations of blood, urine, faeces, sputa, C.S.F., smears etc., and 25 biochemical tests, were carried out.

219 persons were inoculated against Yellow Fever, and 29 medico-legal specimens examined.

MORBID PATHOLOGY.

(2) Material from 60 autopsies, 60 specimens removed surgically and 23 veterinary specimens (including 21 dogs brains) were examined.

84 autopsies were performed, 7 bodies were examined without section. 63 of the autopsies required attendance at inquests and criminal courts.

(3) EXAMINATION OF RODENTS FOR PESTIS.

6256, including 1941 live, rats were identified, 3018 were dissected spleen smears of none of which showed the presence of b.pestis.

2919 fleas were recovered from the live rats,

2099 being \times *braziliensis* the remainder \times *cheopis*. The flea index for the year was 1.5 with only slight monthly variation.

SCIENTIFIC.

(1) Survey of Mosquitoes in the Protectorate.

Owing to the reduction of staff and the volume of routine work performed, it was necessary to reduce all non-essential investigations to a minimum, so that with one single exception all research was stopped. The exception was the mosquito survey of the Protectorate. It was felt by Government that it would be unfortunate to end this at a time when the personnel involved had just begun proficient at catching larval and adult mosquitoes and the results were becoming significant. The survey was continued until early in October when its termination was necessitated. Under present conditions it will not be possible to recommence this work, but the data collected during some two and a half years, involving more than 15,000 adult and 33,000 larval mosquitoes, are available for study.

The practical value of the survey lies in the fact that the groundwork has been prepared for a more extensive survey if and when anti-malaria schemes are proposed for any of these areas. The species prevalent in houses are now known and their association with various local types of breeding place. It is maintained that sufficient information has been obtained regarding the seasonal and geographical distribution of important Anopheline species throughout the Protectorate, and that the next step in the investigation should be to study the importance in the transmission of malaria of certain species which occur as in large numbers as larvae, but are rarely or never collected in examination of houses. It is probable that certain of these species act as efficient transmitters of malaria but do not remain in houses after their blood feed, or bite exclusively out of doors. This matter is of special importance if preventive measures are to be directed against the breeding places of specific malaria vectors. Shortage of staff and our present commitments to Government prevent further work on this subject at the present time.

VIEW OF MOSQUITOES IN THE PROTECTORATE.

The work proceeded on the same plan as in previous years. In addition to the stations reported in 1939, an investigation was commenced in Kabala in February of this year.

From the 57 collecting stations in the Protectorate, averaging 32 examinations in the year, 6,315 adult mosquitoes were collected of which 5,375 were anophelines. The average anopheline ratio per room was 2.9, varying from 8.1 in Kabala, to 1.1 in Moyamba.

More than five-sixths of the mosquitoes collected in houses were malaria vectors, the total number of Anopheline species being thirteen, and more than half were *A. gambiae*. The melanic variety of *gambiae* which can breed in saline water was recovered only from Bonthe, and it is interesting to note that the highest incidence of this species is towards the end of the dry season and in the early months of the rains, whereas the highest incidence of the type form is in July and August. The figures for *A. funestus* are considerably higher than those quoted for 1939 (840) owing to the additional catches made at Kabala which in 1940 contributed some 640 of the total for this species. In Kabala the highest incidence of this species in houses is in May, in contrast to June, July and August in other Protectorate areas, and August and September in Kissy.

Another Anopheline species are of minor importance, though locally they may assume importance; for example, *A. brunnipes* was taken almost exclusively in Kaikahum where this species constituted more than fifty per cent of the catches during January and February. This Anopheline bites men readily and, though so far it has been impossible to incriminate it, it is possibly an important malaria vector in areas where it is common.

The presence of *A. flavicosta* is of interest. This species was taken at Port Loko, a locality very unlike the hinterlands of Nigeria and the Gold Coast, the only places where the species has been found previously. *A. punctifer*, taken at Kabala, is another species new to this Colony. It was first noted in 1936, in

of the British Museum (Natural History) for the identifications of these specimens.

Among the Culicini, the Wyeomyia annulata and Aedonoplus nigricephalus were almost exclusively contributed by Bonthe, and the Ae. (A) punctothoracis mainly by Pujehun. The Mansonioides species were also obtained mainly from Pujehun. As in previous collections of adults during this investigation the absence of Stegomyia is notable.

13,605 larvae were collected from the 57 breeding places, which were visited 1,862 times. Of these, 7,199 were anophelines.

Of the sixty-five species encountered during the year seventeen were anopheline and amongst all species A. gambiae was the most common. It is clear that among the fifty-seven breeding places examined few of them could have been suitable for A. funestus, for relatively few of this species were encountered as larvae, though the adults were present in fair numbers in houses. A. brunnipes, A. rufipes and A. maculipennis were collected for the first time in this survey. The first, which has not hitherto been described, was found during its restricted breeding season with considerable regularity in Bo, and also in Kailahun, Kabala and Makeni, while the last two species were collected only in Kabala.

Among the Culex the presence of C. argenteocornutus (at Bo and Kabala) is interesting since this is the first time it has been found in larval form. The small number of species and individuals of the Stegomyiins recorded is explained by the fact that for the most part the breeding places were selected so as to study the Anopheline population, and these generally prove unattractive to the Stegomyias.

It is of interest to note that the seasonal incidence of larval mosquitoes generally is dissimilar to that shown in the report of last year, in that the total number of larvae collected monthly varied little according to season.

III. MOSQUITO INCIDENCE IN PRINCIPAL.

A total of 3,766 larvae from the streams around Freetown were identified, and the monthly incidence of these during the

period of the investigation is shown according to sources in the following Table.

TABLE IV.

Showing the species and monthly incidence of all species of larval mosquitoes collected from selected breeding places in the streams around Freetown.

| BROOK | Jan. | Feb. | Mar. | Apr. | May | June | July | Dec. | Total |
|---------------------|------|------|------|------|-----|------|------|------|-------|
| <i>Culex</i> | 29 | - | 1 | - | - | - | - | III+ | 30 |
| <i>bita</i> | 152 | 163 | 102 | 63 | 3 | 8 | - | III | 491 |
| <i>travessi</i> | - | - | 10 | 1 | - | - | - | III | 11 |
| <i>stucki</i> | - | - | - | 1 | - | - | - | III | 1 |
| <i>thomasi</i> | 1 | - | - | - | - | - | - | III | 1 |
| <i>trivittatus</i> | 22 | 5 | 118 | 548 | 404 | 152 | 63 | III | 1,312 |
| <i>stellatus</i> | - | - | 1 | 6 | - | - | - | III | 7 |
| <i>thi</i> | 4 | 3 | 54 | 332 | 16 | 2 | 7 | III | 416 |
| <i>townensis</i> | 1 | 3 | 127 | 426 | 156 | 9 | 3 | III | 725 |
| <i>trivittatus</i> | 5 | 2 | 13 | 17 | 5 | 1 | - | III | 45 |
| <i>trivittatus</i> | 34 | 9 | 13 | - | - | - | - | III | 56 |
| <i>maculipennis</i> | 4 | - | - | - | - | - | - | III | 4 |
| <i>maculipennis</i> | - | - | - | 6 | 3 | - | - | III | 9 |
| <i>maculipennis</i> | - | - | 29 | 7 | 1 | 2 | - | III | 39 |
| <i>all excepti</i> | - | - | - | - | - | 1 | - | III | 1 |
| | | | | | | | | | 3,413 |

COLONIAL BROOK

| | | | | | | | | | |
|--------------------|----|----|----|----|---|---|---|-----|-----|
| <i>trivittatus</i> | 30 | - | - | - | - | - | - | III | 30 |
| <i>trivittatus</i> | - | - | - | - | 1 | - | - | III | 1 |
| <i>stucki</i> | - | - | 1 | - | - | - | - | III | 1 |
| <i>townensis</i> | 7 | 2 | 1 | - | 1 | - | - | III | 11 |
| <i>stellatus</i> | 1 | - | - | - | - | - | - | III | 1 |
| <i>thi</i> | 24 | 36 | 77 | 77 | 5 | - | - | III | 219 |
| <i>townensis</i> | 41 | 31 | 64 | 19 | 6 | - | - | III | 161 |
| <i>trivittatus</i> | - | - | - | - | 2 | - | - | III | 2 |
| <i>plendens</i> | 1 | - | - | - | - | - | - | III | 1 |
| | | | | | | | | | 427 |

NEWVILLE AND NICOL'S BROOKS

| | | | | | | | | | |
|--------------------|----|----|---|---|----|----|----|----|-----|
| <i>Culex</i> | 15 | - | - | - | NI | NI | NI | NI | 15 |
| <i>bita</i> | - | - | - | " | " | " | " | 12 | 12 |
| <i>trivittatus</i> | 14 | - | 1 | " | " | " | " | 6 | 21 |
| <i>thi</i> | 1 | 9 | - | " | " | " | " | - | 10 |
| <i>townensis</i> | 5 | 15 | - | " | " | " | " | 14 | 64 |
| <i>trivittatus</i> | 3 | - | 6 | " | " | " | " | - | 9 |
| <i>trivittatus</i> | 18 | 1 | - | " | " | " | " | - | 19 |
| <i>trivittatus</i> | 32 | - | - | " | " | " | " | - | 32 |
| <i>thi</i> | 12 | - | - | " | " | " | " | - | 12 |
| | | | | | | | | | 151 |

Totals: 456 279 618 1,505 601 175 73 59 3,776

* + NI - indicates that the area was not investigated.

It is of interest that no *A. vexans* were found in Hill Station Brook, and in Congo Brook they were present in the lower part of the stream only, and that in Hill Station.

In the annual report of this Laboratory on work during 1938, tables were given showing the monthly incidence of adult and larval anophelines in the Congo Valley. On consideration of these figures it was suggested that the introduction of an automatic flushing device would probably control anopheline breeding in the stream.

In April 1939, an automatic siphon was installed below the Hill Cot slopes, and weekly larval investigations have been made of fixed catching stations at irregular intervals below the siphon. The immediate results obtained in the stations below the siphon suggested that the desired effect was being obtained, but this cannot be stated with certainty until further investigation shows that other factors which might cause a decrease in the larval mosquito population can be ignored.

MALARIA AND PREGNANCY.

The examination at the time of delivery of films of the placental and peripheral blood of patients in the King George V. Memorial Hospital was continued during the year.

501 thick films were examined, 12.6% 13.8% showed parasites and pigment.

(Sgd) G. R. Waller

As. Director of Medical Services.

Medical Department,

Freetown, Sierra Leone,

11th June, 1941.

